



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants : Juliana G. Serafin, et al.

Confirmation No. 7169

Appln. No. : 10/573,694

Examiner: Zimmer

Filed : March 27, 2006

Group Art Unit: 1793

Docket No. : 62397A

Title : CATALYSTS HAVING ENHANCED STABILITY, EFFICIENCY  
AND/OR ACTIVITY FOR ALKYLENE OXIDE PRODUCTION

**Declaration Under 37 C.F. R. § 1.132**

The undersigned, Dr. Albert C. Liu, citizen of the United States of America and residing in Charleston, West Virginia, declare and say that:

1. I am a 1983 graduate of Yale University with a Bachelor of Science degree in Chemistry; a 1986 recipient from Harvard University of a Master of Arts degree in Physics; and a 1989 graduate of Harvard University with a Doctor of Philosophy Degree in Chemical Physics.

2. In October, 1989, I joined Union Carbide Corporation ("UCC") as a senior chemist in EO/G research and development at South Charleston, West Virginia. My responsibilities included research and development of new ethylene oxide ("EO") catalyst formulations, scale up of new formulations for catalyst manufacturing, application of surface science techniques to EO catalyst studies, and technical support for the catalyst production unit.

3. My title and responsibilities changed in November, 1992, when I became a project scientist in EO/G research and development at UCC. In this capacity, I was the lead technologist on an EO carrier project, and participated in the development of the next generation EO catalyst and carrier technologies. I also provided on-site support for EO catalyst commercial trials.

4. Since December 1996, I have been a research scientist in EO/G research and development at UCC. In this role, I have been responsible for the research, development and commercialization of new EO catalyst and carrier formulations, as well as providing technical support for ongoing catalyst and carrier manufacturing operations.

5. I am currently an inventor on two US published applications and two granted US patents in the field of ethylene oxide production.

6. I have read the above referenced patent application, the Office Actions dated May 2, 2008, and October 28, 2008, and the prior art reference, Buffum, U.S. Patent No. 5,145,824 cited by the Examiner.

7. In Buffum, Carrier D is prepared without zirconium compounds but includes 0.4 wt%  $\text{CaSiO}_3$ , for which I calculated an additive composition (expressed as the elemental oxides) of 0.21 wt%  $\text{SiO}_2$  and 0.19 wt%  $\text{CaO}$ , as follows:

$$0.21\text{wt}\%\text{SiO}_2 = 0.4\text{wt}\%\text{CaSiO}_3 \times \frac{60.1\text{g/mole SiO}_2}{116.2\text{g/mole CaSiO}_3}; \text{ and}$$

$$0.19\text{wt}\%\text{CaO} = 0.4\text{wt}\%\text{CaSiO}_3 \times \frac{56.1\text{g/mole CaO}}{116.2\text{g/mole CaSiO}_3}.$$

The corresponding catalyst example, Catalyst C-D, is shown to have T40 of 259°C and S40 of 86.5%. Carrier R is prepared with 0.46 wt% zirconium silicate and 0.44 wt%  $\text{Ca}(\text{NO}_3)_2$ , for which I calculated additive composition (expressed as the elemental oxides) of 0.31 wt%  $\text{ZrO}_2$ , 0.15 wt%  $\text{SiO}_2$  and 0.15 wt%  $\text{CaO}$  as follows:

$$0.31\text{wt}\%\text{ZrO}_2 = 0.46\text{wt}\%\text{ZrSiO}_4 \times \frac{123.2\text{g/mole ZrO}_2}{183.3\text{g/mole ZrSiO}_4};$$

$$0.15\text{wt}\%\text{SiO}_2 = 0.46\text{wt}\%\text{ZrSiO}_4 \times \frac{60.1\text{g/mole SiO}_2}{183.3\text{g/mole ZrSiO}_4}; \text{ and}$$

$$0.15\text{wt}\%\text{CaO} = 0.44\text{wt}\%\text{Ca}(\text{NO}_3)_2 \times \frac{56.1\text{g/mole CaO}}{164.1\text{g/mole Ca}(\text{NO}_3)_2}.$$

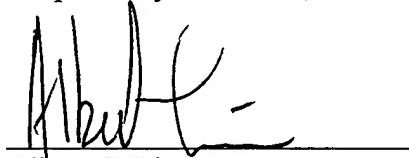
The corresponding catalyst example, Catalyst C-R, is reported to have T40 of 260°C and S40 of 86.6%.

8. The results for Carriers D (no zirconium component) and R (0.46 wt% zirconium silicate) are not meaningfully different — Catalyst C-D is 1°C more active while Catalyst C-R is 0.1% more efficient. Even if, as the Examiner contends, and which in mentioning I do not admit, some amount of the original zirconium silicate remains in Carrier

R in the form of zirconium silicate, these data fail to demonstrate the performance enhancement set forth in present claim 1.

9. I declare further that all statements made herein of my knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Albert C. Liu', is written over a horizontal line.

Albert C. Liu

April 28, 2009